antenna 15 is covered with the dielectric tube 14 to form the measuring probe 12 in the above embodiment, the measuring probe 12 is not necessarily covered with the tube 14. That is, it is possible that a coaxial cable is formed at its tip end with the antenna such that the loop antenna 15 or the core wire 16a projects like a needle, and the coaxial cable is directly inserted to plasma to measure the plasma density. In this case, an insulative file may be adhered to the antenna exposed to plasma. However, in the present invention, high-frequency power (electromagnetic wave) is radiated from the antenna, there is little possibility that the measurement is influenced by the insulative film adhered to the antenna.

(2) In the above embodiment, the tube 14 of the measuring probe 12 is detachably mounted to the wall of the chamber 1. However, this structure may be modified such that the tube 14 of the measuring probe 12 is previously fixed to the wall of the chamber 1, and whenever the measurement is carried out, the loop antenna 15, the cable 16 and the conductor piece 17 are inserted into the tube 14 to measure.

(3) According to the measuring method of the present invention, as shown in Fig. 6, some plasma absorption frequencies (absorption peaks Pb, Pc, Pd) are observed, other than the plasma surface wave resonance frequency f corresponding to the absorption peak Pa. It is considered that these other plasma absorption frequencies correspond to so-called Tonks-Dattner. As described above, the resonance frequency is related to the electron plasma angle frequency ω_p, if the plasma density is changed, the Tonks-Dattner resonance frequency is also changed. Therefore, plasma density information can be obtained from the Tonks-Dattner resonance frequency. However, since the plasma surface wave resonance frequency f is directly related to the electron density in plasma which is substantially equivalent to the plasma density, the plasma surface wave resonance frequency f is especially useful plasma density information.

(4) In the case of the above embodiment, the physical amount indicative of absorption state of the frequency power by the plasma load was the reflection coefficient of the high-frequency power. In the present invention, impedance value of plasma load is also the physical amount indicative of absorption state of the frequency power by the plasma load. In this case, the counter frequency characteristics of the impedance of plasma load are measured using a channel analyzer.

(5) Although the single measuring probe 12 is disposed in the chamber 1 in the case of the above embodiment, this structure can be modified such that a plurality of measuring probes 12 are disposed in the chamber 1.

(6) Although the plasma density information is obtained by inserting the measuring probe 12 into plasma in the case of the above embodiment, it is not always necessary to dispose the measuring probe 12 into plasma. For example, the chamber 1 shown in Fig. 1 may be provided with a dielectric window such as heat-resistant reinforce glass or quartz, and a frequency irradiation antenna may be provided outside the window, and high-frequency power may be irradiated to plasma in the chamber 1 through this window.

(7) The shape and material of the measuring probe, and kind of the antenna of the invention should not be limited to those of the above embodiment. The plasma of interest of the present invention is not only plasma for processing, and includes plasma used for a particle beam source or an analyzing apparatus.

(8) In the above embodiment, the length L between the base end of the loop antenna 15 and the tip end of the tube 14 in the measuring probe 12 is varied, and plasma absorption frequencies of the same level are obtained at the various lengths as the plasma surface wave resonance frequency f. This structure can be modified as follows. As shown in Fig. 8, a plurality of wire-like antennas 15a and 15a as well as

coaxial cables 16A and 16B are accommodated in the dielectric tube 14a such that lengths La and Lb between the antenna base end and the tip end of the tube 14 are different. Then, the plasma absorption frequency is obtained for each of the antennas by the power reflection coefficient frequency characteristic obtaining section 22 of the probe control section 13, and the plasma absorption frequency of the resonance frequency is obtained as the plasma surface wave resonance frequency f by an absorption frequency comparator 22a.

Alternatively, the wire-like antennas 15a, 15a and the coaxial cables 16A, 16B may not be accommodated in a single dielectric tube, and may be separately accommodated in different dielectric tubes 14, as shown in Fig. 9.

With these modifications, the plasma surface wave resonance frequency f can be easily obtained even if the tip end length of the tube 14 is not varied.

(9) In the case of the above embodiment, the reflection amount of the high-frequency power for measuring the plasma density information is taken out by the directional coupler 19. This structure can be modified such that the reflection amount of the high-frequency power is measured by measuring the amount of electric current of high-frequency amplifier for supplying high-frequency power for measuring the plasma density information. The amount of electric current of the high-frequency amplifier has extremely excellent correlation with the reflection amount of the high-frequency power, and it is easy to measure the amount of electric current.

More specifically, as shown in Fig. 10, the amount of electric current of a high-frequency amplifier section 18b provided next to a signal oscillator 18a of the high-frequency oscillator 18 is taken out by an amplifier current detecting section 19a, and sent to the power reflection coefficient frequency characteristic obtaining section 22. An example of the amplifier current detecting section 19a is a circuit structure for